Republic of Kenya

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KS 1884-1 (2008) (English): Specification — Accessories for use in antenna installations — Part 1: Splitters (Draft Standard)

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Specification — Accessories for use in antenna installations —

Part 1: Splitters

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TECHNICAL COMMITTEE REPRESENTATION

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Widestream Communications Limited
Kenya Broadcasting Corporation
Meteorological Department
Kenya Power & Lighting Company
Telea (K) Limited
SR Kenya Limited
Department of Defence
Kenya Police Force
Communications Commission of Kenya
Kenya Bureau of Standards — Secretariat

REVISION OF KENYA STANDARDS

In order to keep abreast of progress in industry, Kenya standards shall be regularly reviewed. Suggestions for improvement to published standards, addressed to the Managing Director, Kenya Bureau of Standards, are welcome.

Specification — Accessories for use in antenna installations —

Part 1: Splitters

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FOREWORD

This Kenya standard was prepared by the *Communication Equipment* under the mandate of the Electrical Industry Standards Committee in accordance with the procedures of the Bureau and is in compliance with Annex 3 of the WTO/TB Agreement.

Normative and informative annexes

A 'normative' annex is an integral part of a standard, whereas an 'informative' annex is only for information and guidance.

Summary of development

This Kenya Standard, having been prepared by the Communication Equipment Technical Committee was first approved by the National Standards Council in December 2008	**Amendments issued since publication**		
	Amd. No.	Date	Text affected

Contents

Specification — Accessories for use in antenna installations — Part 1: Splitters

1 Scope

This part of KS 1884 specifies the mechanical and electrical requirements for splitters for use in antenna installations both indoors and outdoors, covering the VHF/UHF television and VHP sound broadcast bands.

2 Normative references

The following referenced documents are indispensable for the application of this Kenya Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-2-11, *Basic environmental testing procedures — Part 2-11: Tests — Test Ka: Salt mist*

IEC 60068-2-18, *Environmental testing — Part 2-18: Tests — Test R and guidance: Water*

IEC 60068-2-21, *Environmental testing — Part 2-21: Tests — Test U: Robustness of terminations and integral mounting devices*

IEC 60934, *Circuit-breakers for equipment (CBE)*

3 Definitions

For the purposes of this part of KS 1884, the following definitions apply:

3.1
acceptable
acceptable to the authority administering this standard, or to the parties concluding the purchase contract, as relevant

3.2
mutual isolation
isolation between outputs

3.3
return loss
the difference between the forward voltage (or current) and the reflected voltage (or current) at the splitter input terminals, expressed in decibels

3.4
splitter
a passive unit that splits the input signal into several outputs that are normally of uniform signal level

3.5
through-loss
the reduction in signal level between input and output

4 General requirements

4.1 Material

Splitters and mounting facilities shall be fabricated from a material that is suitable for use in the environment in which the splitter is intended to be used.

Non-metallic materials used shall be stabilized to ultraviolet (UV) light.

4.2 Corrosion protection

When a splitter and its mounting facilities, that are intended for outdoor use, are tested in accordance with 7.1, they shall show no sign of corrosion. (See also 6.1.)

5 Mechanical requirements

5.1 Terminal robustness

The requirement given below applies only to splitters where screw type terminal cable connections are incorporated. It does not apply where suitable terminal sockets are fitted.

The input and output cable connections shall be so designed that they will accommodate a 75 Q coaxial cable (of dimensions specified by the splitter manufacturer) in such a way that the characteristic impedance of the cable is not affected. When the splitter is tested in accordance with 7.2, there shall be no sign of damage or deformation of the cable or terminals and the cable shall not have become dislodged.

5.2 Sealing

When a splitter that is intended for use outdoors is tested in accordance with 7.3, no water shall have entered the housing.

5.3 Continuity between input and output — outer cable terminals

When tested in accordance with 7.8, the circuit-breaker shall have tripped on each performance of the procedure in 7.8.2.2. When the track between the terminals is being inspected, there shall be no sign of deterioration owing to generation of heat.

6 Electrical requirements

6.1 Amplitude frequency response of outputs

The manufacturer shall state the frequency response of the outputs and shall give the through-loss, in decibels, at the extreme points of the specified frequency range. These values are the "nominal values", and the "nominal line" is the straight line that joins these points.

When determined in accordance with 7.4, the through-loss deviation, at any frequency, from the nominal line shall not exceed the following:

— FM band - 1 dB;

— Band III - 1 dB; and

— Band IV and V - 2 dB.

When a splitter that is intended for outdoor use is again tested in accordance with 7.4, after having been subjected to the corrosion protection test of 7.1, the results of this second test shall not differ from those of the first.

6.2 Mutual isolation between outputs

When determined in accordance with 7.5, the minimum isolation between outputs, in decibels, in the frequency range stated by the manufacturer shall, at a frequency of 80 MHz but reduced by 1.5 dB per octave, be equivalent to:

$$20 + 20\log(U_n/U_m)$$

where

U_n is the signal level at output n;

U_m is the signal level at output m; and

$U_n > U_m$.

6.3 Return loss

When determined in accordance with 7.6, the return loss within the frequency range stated by the manufacturer shall, at a frequency of 80 MHz but reduced by 1.5 dB per octave, be a minimum of 40 dB.

6.4 Component radiation characteristic

When determined in accordance with 7.7, the minimum value for the component radiation characteristic shall be:

— 60 dB in the frequency range 5 MHz to 1000 MHz; and

— 37 dB in the frequency range 1 000 MHz to 1 750 MHz.

7 Test methods

7.1 Corrosion protection test

NOTE This test is applicable only to those splitters and associated mounting facilities that are intended for outdoor use or for use in situations where high humidity and temperatures are experienced, and is carried out after the test given in 7.4.

7.1.1 Apparatus

Chamber and solution, for producing the salt mist as described in IEC 60068-2-11.

7.1.2 Procedure

7.1.2.1 Suspend the component under test, together with its mounting facilities (where supplied), as centrally as possible in the chamber.

7.1.2.2 Subject the component to the procedure described in test Ka of IEC 60068-2-11, for a period of 24 h.

7.1.2.3 Repeat 7.1.2.2 three times (i.e. to a total of four times).

7.1.2.4 Examine the component and its mounting facilities (where supplied) for signs of corrosion, and then carry out the test given in 7.4.

7.1.2.5 Check for compliance with 4.2.

7.2 Test for terminal robustness

7.2.1 Apparatus

Clamp, suitable for mounting the component under test (as given in 7.2.2), and capable of withstanding the forces given in 7.2.3.

7.2.2 Mounting of the components

Mount the component in the clamp and connect the coaxial cable recommended by the manufacturer to each outlet in turn, in accordance with the manufacturer's instructions.

7.2.3 Procedure

Follow the procedures specified in test U_{a1} and test U_b of IEC 60068-2-21, once for each test, applying forces of 40 N and 20 N respectively to the coaxial cable. Examine the cable and terminals for compliance with 5.1.

7.3 Sealing test

7.3.1 Apparatus

Apparatus, as specified in test Rb of IEC 60068-2-18.

7.3.2 Test conditions

The test conditions shall be as specified in test Rb of IEC 60068-2-18.

7.3.3 Procedure

So mount the component under test in the apparatus that it will be in the direct spray of at least one shower head, the component being as near as possible to the centre of the shower arrangement. Subject the component to a shower for 1 h and then examine it. Check for compliance with 5.2.

7.4 Test for amplitude frequency response of outputs

NOTE In the case of a splitter that is intended for outdoor use, this test is carried out both before and after the test given in 7.1.

7.4.1 Apparatus

7.4.1.1 Signal generator, with appropriate frequency coverage.

7.4.1.2 Measuring receiver, with appropriate frequency coverage.

7.4.1.3 Two suitable calibrated attenuators, of appropriate impedance. These may be incorporated in the signal generator and receiver.

7.4.1.4 Suitable coaxial changeover switch.

7.4.2 Procedure

7.4.2.1 Connect the apparatus as shown in Figure 1.

7.4.2.2 With the switch in position A, so adjust attenuator 1 that the input from the signal generator to the component under test is at a level comparable to that encountered in use.

7.4.2.3 With the switch in position A, adjust attenuator 2 to obtain the convenient reading on the measuring receiver, and record the attenuation in attenuator 2 as U_a dB.

7.4.2.4 With the switch in position B, reduce the attenuation in attenuator 2 to restore the level obtained in 7.4.2.3, and record the attenuation in attenuator 2 as U_b dB.

7.4.2.5 Record the through-loss U_a - U_b.

7.4.2.6 Measure and record the through-loss at the end frequencies of the frequency range claimed by the manufacturer and at a sufficient number of frequencies within this range to enable a curve of through-loss against frequency to be plotted.

7.4.2.7 Check for compliance with 6.1.

7.5 Test for mutual isolation between outputs

7.5.1 Apparatus

7.5.1.1 Signal generator, with appropriate frequency coverage.

7.5.1.2 Measuring receiver, with appropriate frequency coverage.

7.5.1.3 Three suitable calibrated attenuators, of appropriate impedance. Two of these may be incorporated in the signal generator and receiver.

7.5.1.4 Suitable coaxial changeover switch.

7.5.2 Procedure

7.5.2.1 Connect the apparatus as shown in Figure 2.

7.5.2.2 Set the signal generator to an unmodulated frequency within the desired range, and, with the switch in position B, adjust attenuator 1 to give a comparable input level to that encountered in use.

7.5.2.3 Adjust attenuator 2 to give a suitable reading on the measuring receiver.

7.5.2.4 With the switch in position A, use attenuator 3 to insert attenuation until the reading on the measuring receiver is the same as that obtained in 7.5.2.3. The amount of attenuation inserted is the mutual isolation between outputs at the frequency of measurement.

7.5.2.5 Record the signal levels U_n and U_m at the outputs n and m respectively.

7.5.2.6 Measure and record the mutual isolation at the end frequencies of the manufacturer's stated frequency range and at a sufficient number of frequencies within this range to enable a curve of mutual isolation against frequency to be plotted.

7.5.2.7 Check for compliance with 6.2.

7.6 Test for return loss

7.6.1 Apparatus

7.6.1.1 Signal generator, with appropriate frequency coverage.

7.6.1.2 Measuring receiver, with appropriate frequency coverage.

7.6.1.3 Terminating impedance, for every output port of the item under test.

7.6.1.4 Standing wave ratio (SWR) measuring bridge.

7.6.2 Procedure

7.6.2.1 Connect the apparatus as shown in Figure 3.

7.6.2.2 Using an unmodulated signal that is within the manufacturer's stated frequency range and at a level comparable to normal use, calibrate the SWR measuring bridge in accordance with the manufacturer's manual, and record the reference level A_1.

7.6.2.3 Connect the component under test to the test port of the bridge and, without altering the level of the signal generator, note the reading A_2 on the measuring receiver. The return loss is given by $(A_1 – A_2)$dB.

7.6.2.4 Measure and record the return loss at the end frequencies of the frequency range stated by the manufacturer and at a sufficient number of frequencies within this range to enable a curve of return loss against frequency to be plotted.

7.6.2.5 Check for compliance with 6.3.

7.7 Test for component radiation characteristics

In the frequency range 30 MHz to 300 MHz, most of the radiation is from input and output cables and therefore the absorbing clamp method is specified; but in the frequency range 300 MHz to 1 GHz, the splitter itself could radiate and therefore a "substitute radiation method" of measurement, with and without a connected output cable, is specified.

7.7.1 Apparatus

7.7.1.1 Signal generator, that covers the appropriate frequency range and is of sufficient output power.

7.7.1.2 Absorbing clamp, that conforms to the description in Annex A (for absorbing clamp method only).

7.7.1.3 Stop filter, as described in Annex B (for radiation method only).

7.7.1.4 Transmitting dipole antenna, of known radiation characteristics and suitable for the required frequency range (for radiation method only).

7.7.1.5 Receiving antenna, of known radiation characteristics and suitable for the required frequency range (for radiation method only).

7.7.1.6 Measuring set, of appropriate impedance and that covers the required frequency range.

7.7.1.7 Measurement cable, at least 0.5 A in length (at the lowest frequency of interest) plus 2 m, and of appropriate impedance.

7.7.1.8 Shielded terminating loads, of appropriate impedance and design.

7.7.1.9 All necessary coupling devices, of appropriate design.

7.7.1.10 Absorbing devices, such as ferrite rings, sufficient to suppress signals from the equipment under test on its input.

7.7.1.11 Suitable calibrated attenuator, of appropriate impedance.

7.7.1.12 Suitable coaxial changeover switch.

7.7.2 General measurement requirements

The test cables, coupling devices and terminations shall all be well matched and well screened. Test equipment should normally be 75 Ω impedance.

An indoor or an outdoor test site may be used. When an indoor test site is selected, the room shall be of sufficient size. Any reflecting and absorbing objects shall be so positioned or sufficiently moved from the measurement set-up that they do not influence the results.

7.7.3 Equipment layout and connections

The measurement set-up and equipment layout for the absorbing clamp method (frequency range 30 MHz to 300 MHz), which is outlined in 7.7.5, is shown in Figures 4, 5 and 6.

The measurement set-up and equipment layout for the radiation method (frequency range 300 MHz to 1 GHz), which is outlined in 7.7.6, is shown in figures 7, 8 and 9.

The component under test shall be placed at a height of approximately 1 m above the ground, on a non-metallic support on which the absorbing clamp or stop filter can be accommodated and moved.

The output of the component under test shall be connected to a measurement cable of the same characteristic impedance and the cable shall be terminated with the nominal impedance of the output via the attenuator and coaxial switch.

Well screened cables shall be connected to the terminals of the component under test as specified by the manufacturer. When a direct connection cannot be made owing to the dimension of the well screened cable, a connector shall be used (see Annex A).

The unused outputs, if any, of the component under test shall be terminated with their nominal impedance by means of non-radiating loads connected direct, without any cabling (see Figure 10).

The signal generator coaxial cable shall be provided with suitable absorbing devices (e.g. ferrite rings), placed close to the component under test, to avoid measurement errors.

7.7.4 Operating conditions

The component under test shall be operated in accordance with the manufacturer's recommendations and shall be tested with a signal input to the splitter that is equal to the maximum input specified by the manufacturer.

Measurements shall be performed on all output ports in turn, and at the highest and lowest frequencies in the range specified by the manufacturer, and at a selection of intermediate frequencies so chosen as to give a realistic representation of the radiation pattern throughout the operating frequency range.

7.7.5 Procedure (absorbing clamp method — frequency range 30 MHz to 300 MHz)

For sensibly consistent results the disposition of the signal generator cable preceding the absorbing clamp, the signal generator mains lead and the measurement cable beyond the absorbing clamp, and their proximity to other items, shall not influence the readings on the measuring set by more than ±1 dB. This shall be checked by moving the cables and by running a hand along their length after the equipment has been set up in accordance with Figures 4, 5 and 6.

7.7.5.1 With the equipment set up as shown in Figures 5 and 6 and the measurement cable coupled to an output port of the component under test, position the absorbing clamp at the component end of the measurement cable and place the coaxial switch in the "check level" mode. Adjust the signal generator to the test frequency and to an input level that equates to the maximum rated output level of the component under test. Record this input level V_i (in microvolts) from the signal generator.

7.7.5.2 Tune the measuring set. Turn the coaxial switch to the "measure radiation" mode. Set the calibrated attenuator to 0 dB. Move the absorbing clamp along the cable away from the component until a maximum reading is obtained on the measuring set (at a spacing of ±0.5λ). Record the level of the reading V_m obtained.

7.7.5.3 Repeat the procedure in 7.7.5.1 and 7.7.5.2 for each output port and at the frequencies specified in 7.7.4.

7.7.5.4 From the preceding tests, the highest reading of V_m obtained for each frequency then has to be converted to the "substituted radiation power" p_m, using the calibration chart of the absorbing clamp. Convert into power form p, the values of V_i recorded. Calculate the component radiation characteristic, in decibels, from the following formula:

$$Cfx = 10 \log p_i / p_m$$

where

Cfx is the component radiation characteristic at frequency *x*;

p_i is the maximum input power (as used for the measurement);

p_m is the maximum value of substituted radiated power obtained at frequency *fx*; and

fx is one of the frequencies of measurement.

7.7.5.5 Check for compliance with 6.4.

7.7.6 Procedure (radiation method — 300 MHz to 1 GHz)

For sensibly consistent results, the combined residual radiation and pick-up of the test set shall at all frequencies be at least 20 dB lower than the expected measurement value.

This shall be checked after the first component radiation measurement and before the result is recorded, by removing the component under test and, with the input and output leads correctly terminated and the position of these connecting leads and other test equipment otherwise unchanged, measuring the residual radiation. The residual radiation measured shall be at least 20 dB lower than that measured, or expected to be measured, with the component connected. If this cannot be achieved, repositioning of the test equipment may be helpful.

The positioning of the transmitting and receiving antenna shall be carefully adjusted to ensure sensibly consistent results over the required frequency range.

This shall be checked with a transmitting antenna connected horizontally in place of, and in the same position as, the component under test, and parallel with the receiving antenna not less than 1.3 m away. A test shall then be carried out to ensure that, when the transmitting antenna is moved vertically, or laterally, by ± 10 cm, the measuring set readings do not vary by more than ± 1.5 dB. This test shall be repeated at each test frequency and the distance d and the height *h* adjusted until this requirement is met (see figure 9).

The antennae positions, supports, etc., shall then be moved round in the horizontal plane by 90°, keeping the same precise spacing distance between the antennae. The new reading obtained shall be noted.
If the readings vary by more than 3 dB, the following may be required:

a) change the size of the room;

b) add metallic layers or plates to improve reflection properties of the ground;

c) use a corner reflector antenna; and

d) add absorbing material to the walls.

7.7.6.1 Measurement procedure without measurement cable (all output ports terminated)

7.7.6.1.1 With the equipment connected as in Figures 7 and 9 and the coaxial switch in the "measure radiation" mode, adjust the signal generator to the test frequency and to an input level that will give the maximum rated output level from the component under test. Record this input level V_i from the signal generator. Tune the measuring set and adjust the controls to give a convenient reading. Then rotate the component under test in all planes, until the maximum reading V_r is obtained, and record this reading.

7.7.6.1.2 Substitute the transmitting antenna for the component under test, and so place it that it is parallel with the receiving antenna and that its centre corresponds to that of the component under test (when the component is in position). Adjust the output level of the signal generator to give the same reading V_r on the measuring set. The available power from the generator to the transmitting antenna is the substituted radiated power p_s from the component under test. Record this value.

7.7.6.1.3 Repeat this procedure for each of the test frequencies specified in 7.7.4.

7.7.6.1.4 The highest reading of p_s obtained at each frequency in the preceding test indicates the radiation characteristic of the component, expressed as the substituted radiated power.

7.7.6.1.5 Calculate the component radiation characteristic, in decibels, from the following formula:

$$Cfx = 10\log p_i/p_s$$

where

Cfx is the component radiation characteristic at frequency x;

p_i is the maximum input power (as used for the measurement);

p_s is the maximum value of substituted radiated power obtained at frequency fx; and

fx is one of the frequencies of measurement.

7.7.6.1.6 Check for compliance with 6.4.

7.7.6.2 Measurement procedure with measurement cable connected to one port

7.7.6.2.1 With the equipment connected as in Figures 8, 9 and 10 and the coaxial switch in the "measure radiation" mode, connect the measurement cable to the port to be tested. So position the measurement cable, with stop filter in position at the component end, that it is parallel to the receiving antenna. Adjust the signal generator to the test frequency and to an input level that will give the maximum rated output level from the component under test.

Record this input level V\ from the signal generator. Tune the measuring set and adjust the controls to give a convenient reading. Tune the stop filter to the calibration mark for the test frequency in use (as determined in Annex B). Move the stop filter along the cable, away from the component, until a maximum reading is obtained on the measuring set (at a spacing of ± 0.5λ). By observing the meter reading whilst making fine adjustments to the filter tuning, check that the stop filter is correctly tuned. Then rotate the component under test in all planes, to determine whether a higher reading can be obtained. If it can, readjust the position of the stop filter, etc., and record the final maximum reading V_m.

7.7.6.2.2 Substitute the transmitting antenna for the component under test, and so place it that it is parallel with the receiving antenna and that its centre corresponds to that of the component under test (when the component is in position). Adjust the output level of the signal generator to give the same reading V_m on the measuring set. The available power from the signal generator to the transmitting antenna is the substituted radiation power p_s from the component under test. Record this value.

7.7.6.2.3 Repeat this procedure for each of the test frequencies specified in 7.7.4.

7.7.6.2.4 Repeat this procedure for each of the measurement ports specified in 7.7.4.

7.7.6.2.5 The highest reading of p_s obtained at each frequency in the preceding test and in the test given in 7.7.6.1, indicates the radiation characteristic of the component, expressed as the substituted radiated power. Using the above p_s value and the V_1 values recorded, but converted into power form pit calculate the resultant component radiation characteristic at each frequency, in decibels, from the following formula:

$$Cfx = 10\log p_i/p_s$$

where

Cfx is the component radiation characteristic at frequency *x*;

p_i is the maximum input power (as used for the measurement);

p_s is the maximum value of substituted radiated power obtained at frequency *fx*; and

fx is one of the frequencies of measurement.

7.7.6.2.6 Check for compliance with 6.4.

7.8 Test for continuity between input and output — outer cable terminals

7.8.1 Apparatus

7.8.1.1 20 A moulded-case circuit-breaker, that complies with the relevant clauses of IEC 60934.

7.8.1.2 Load resistor, with a resistance of approximately 7 Ω and that is capable of carrying 20 A for a period equal to the time taken for the circuit-breaker to trip.

7.8.1.3 Mains switch, capable of carrying a minimum of 30 A.

7.8.2 Procedure

7.8.2.1 Connect the apparatus as shown in Figure 11.

7.8.2.2 Switch the apparatus on and ensure that the circuit-breaker has tripped, then switch the apparatus off and restore the circuit-breaker to its operational state.

7.8.2.3 Repeat the procedure specified in 7.8.2.2 a further nine times (i.e. to a total of 10 times).

7.8.2.4 Check for compliance with 5.3.

8 Packing and marking

8.1 Packing

Each splitter shall be so acceptably packed as to protect it from damage during normal handling, transportation and storage.

8.2 Marking

The splitter shall bear the following information:

a) the manufacturer's trade name or trade mark or both;

b) the frequency range for which the splitter has been designed;

c) identification marks for the input and output(s); and

d) whether or not the splitter is suitable for outdoor use.

NOTE It is advisable, in addition, to print the above information on the packaging.

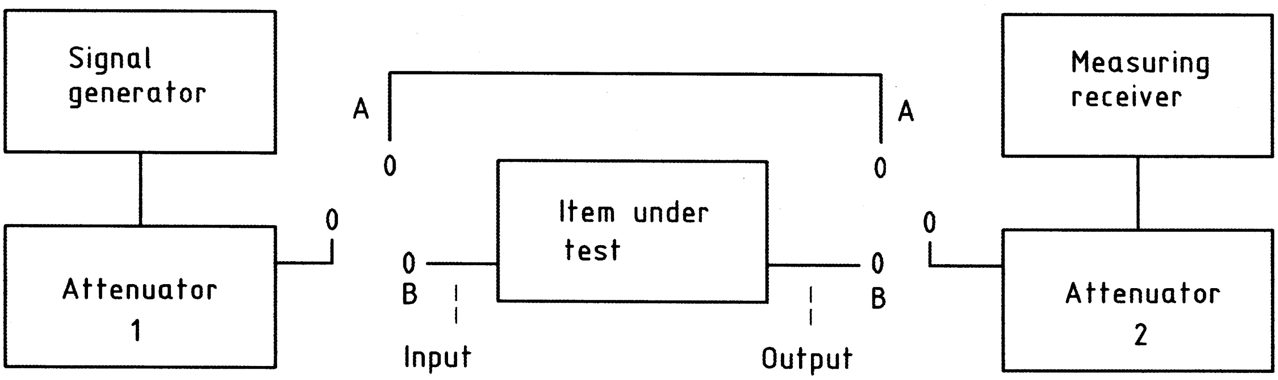


Figure 1 — Apparatus for test for amplitude frequency response of outputs

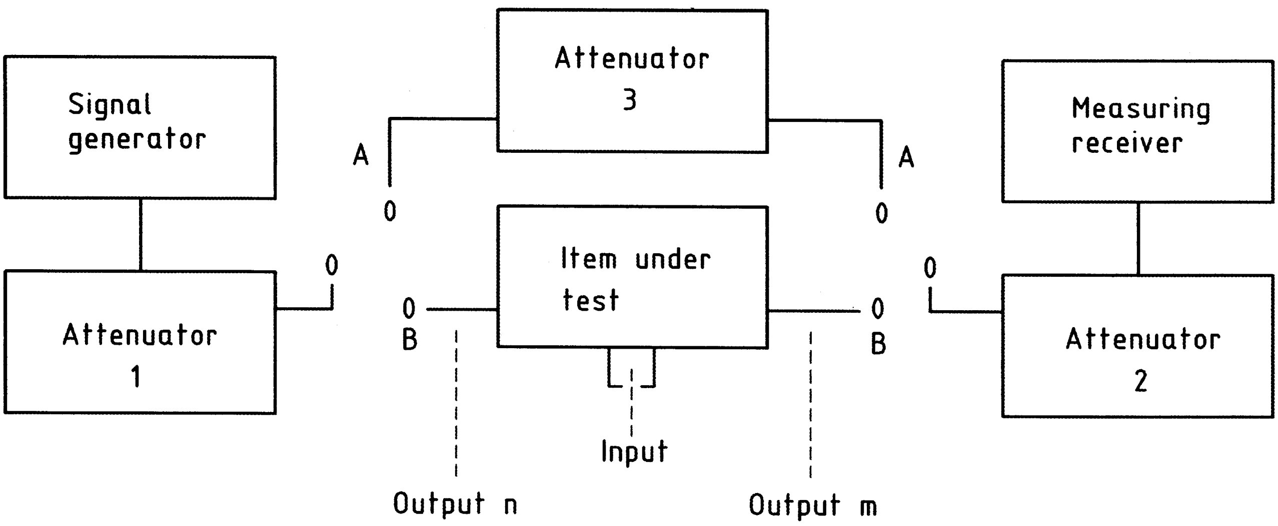


Figure 2 — Apparatus for test for mutual isolation between outputs

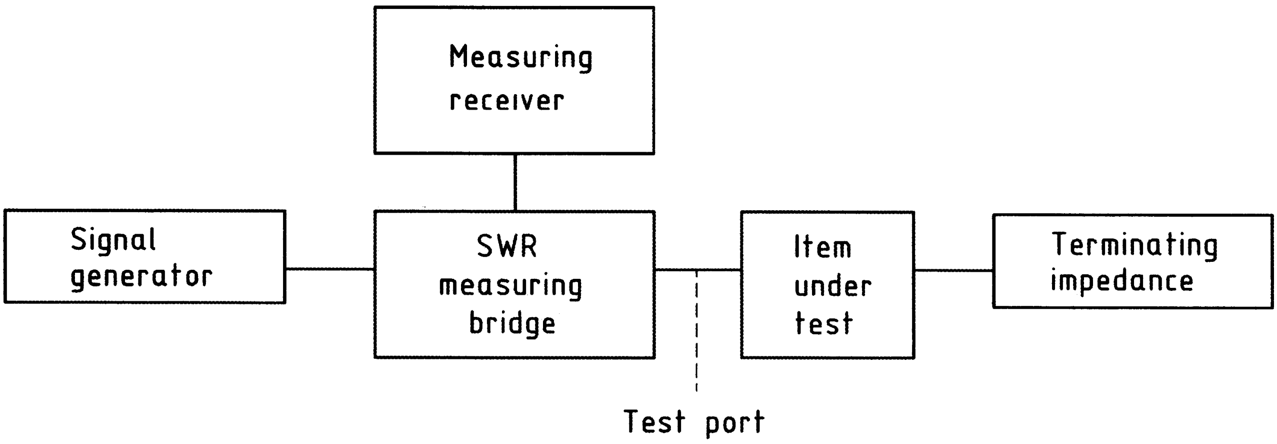
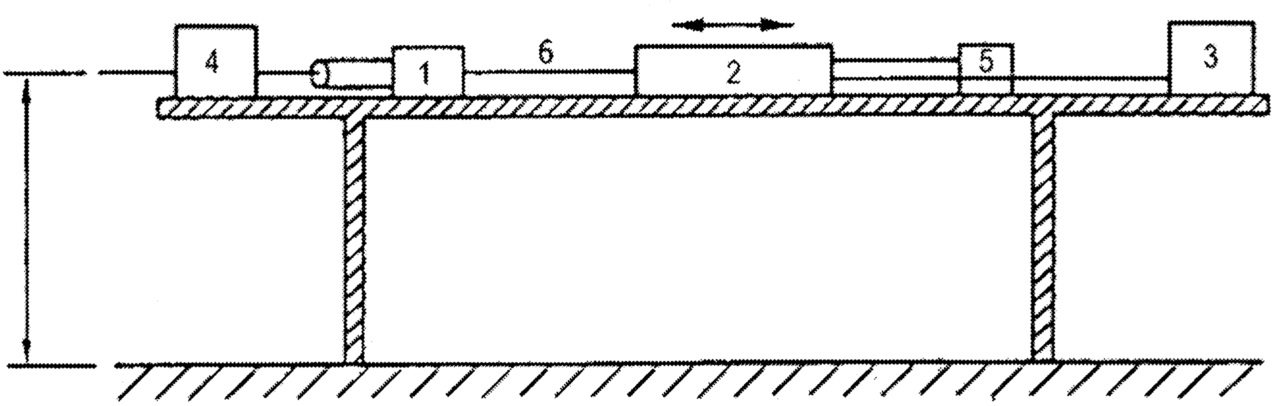
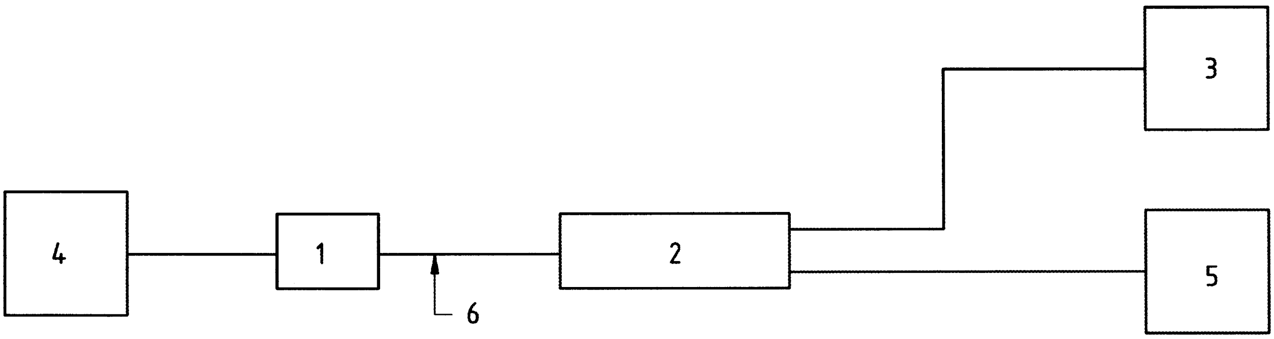


Figure 3 — Apparatus for test for return loss



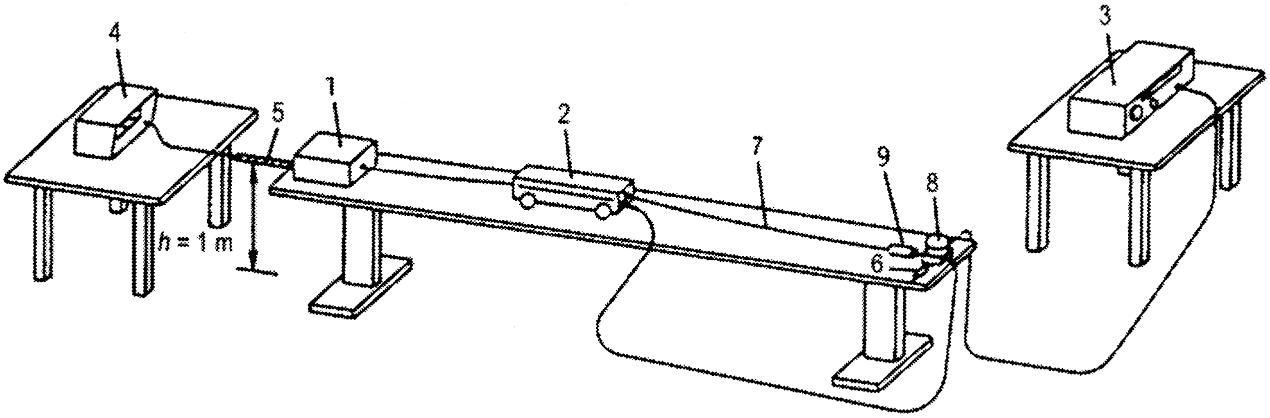
Key
1 Component under test
2 Absorbing clamp
3 Measuring set
4 Signal generator
5 Terminating resistor
6 Measurement cable

Figure 4 — Measurement set-up — Test for screening attenuation absorbing clamp method (frequency range 30 MHz to 300 MHz)



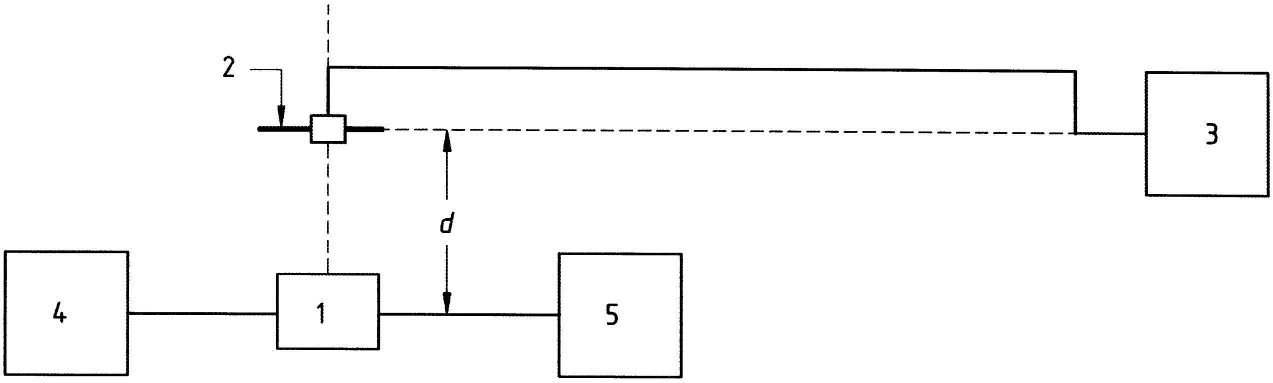
Key
1 Component under test
2 Absorbing clamp
3 Measuring set
4 Signal generator
5 Terminating resistor
6 Measurement cable

Figure 5 — Absorbing clamp method (frequency range 30 MHz to 300 MHz)



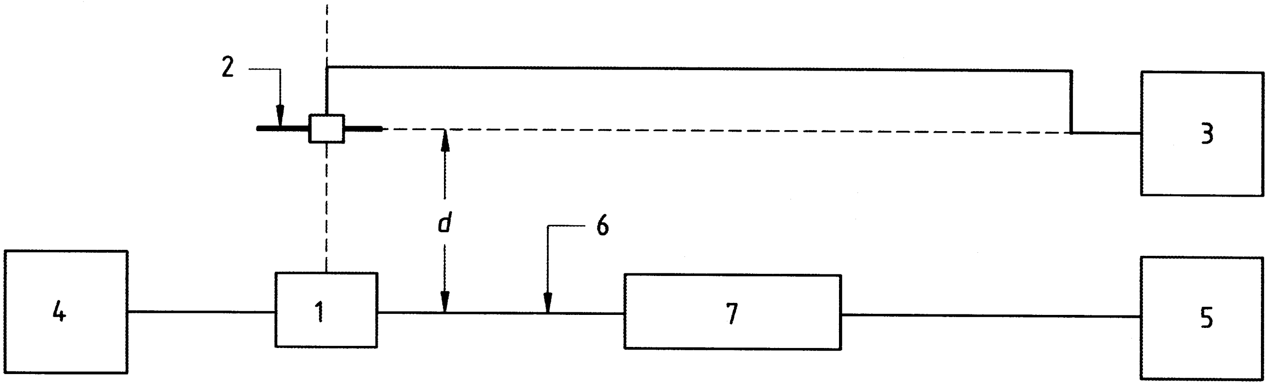
Key
1 Component under test
2 Absorbing clamp
3 Measuring set
4 Signal generator
5 Absorbing device
6 Terminating resistor
7 Measurement cable
8 Coaxial switch
9 Attenuator

Figure 6 — Example of general measurement set-up for frequency range 30 MHz to 300 MHz



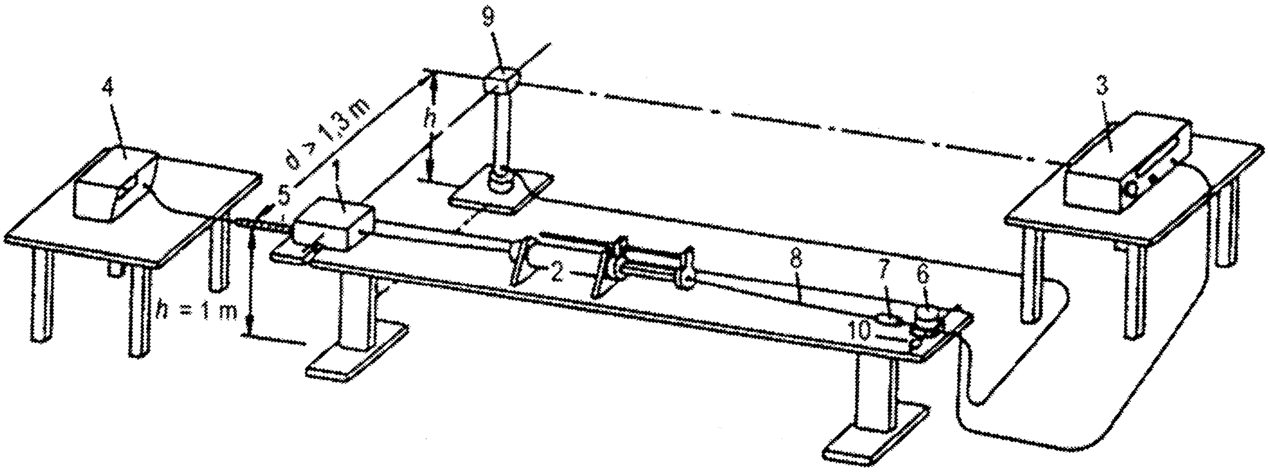
Key
1 Component under test
2 Receiving antenna
3 Measuring set
4 Signal generator
5 Terminating resistor

Figure 7 — Radiation method (frequency range 300 MHz to 1 GHz) without measurement cable



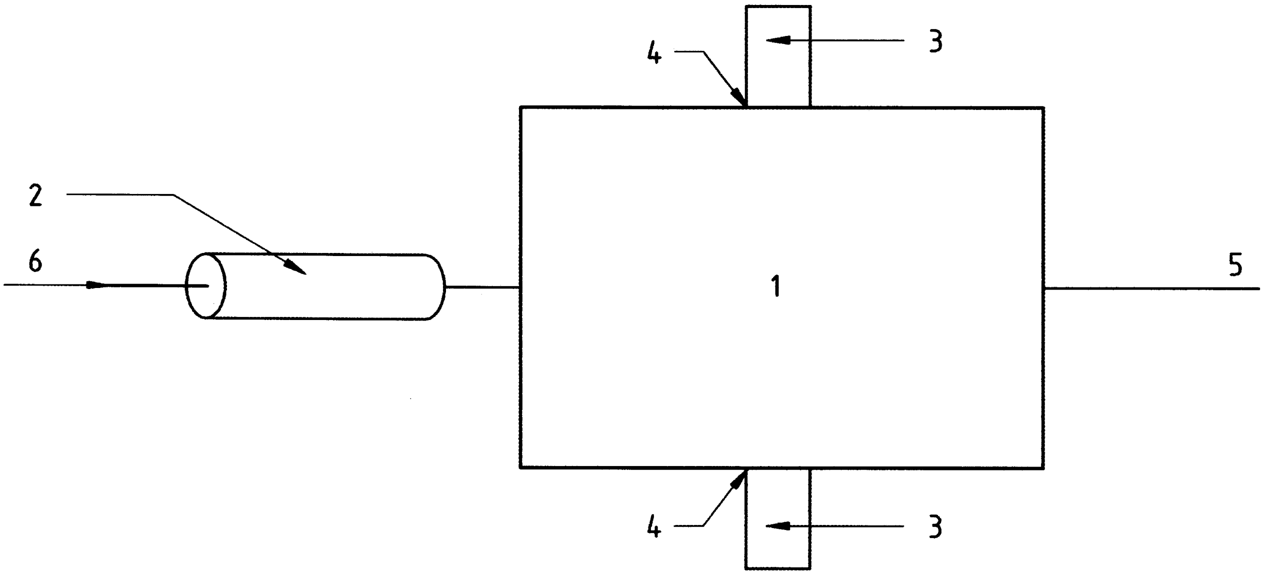
Key
1 Component under test
2 Receiving antenna
3 Measuring set
4 Signal generator
5 Terminating resistor
6 Measurement cable
7 Stop filter

Figure 8 — Radiation method (frequency range 300 MHz to 1 GHz) with measurement cable



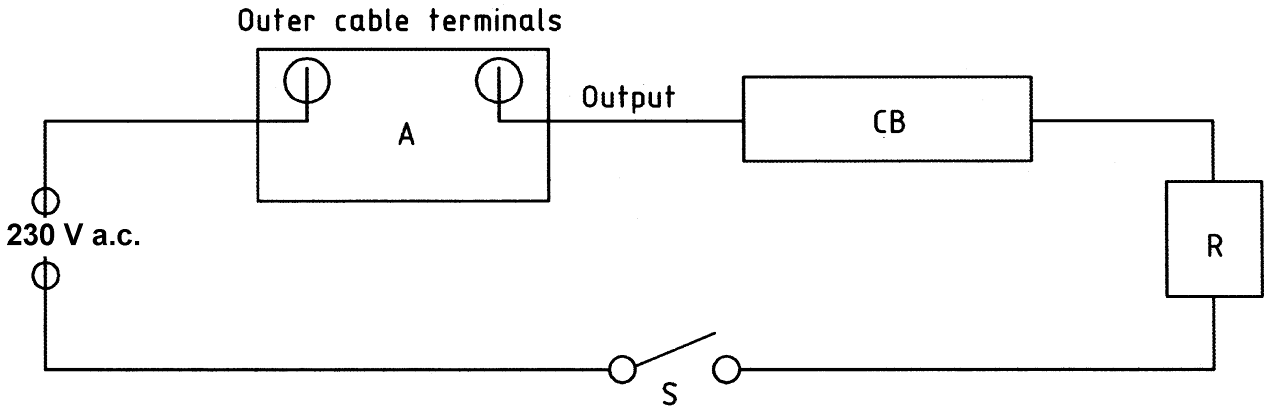
Key
1 Component under test
2 Stop filter
3 Measuring set
4 Signal generator
5 Absorbing device
6 Coaxial switch
7 Attenuator
8 Measurement cable
9 Receiving antenna
10 Terminating resistor

Figure 9 — Example of measurement set-up for frequency range 300 MHz to 1 GHz



Key
1 Component under test
2 Absorbing device
3 Non-radiating resistor
4 Unused output
5 Measurement cable
6 From the generator

Figure 10 — Termination of component with several outputs



where

A is the unit under test;

CB is the 20 A circuit breaker;

R is the load resistor; and

S is the main switch.

Figure 11 — Circuit arrangement for test for continuity between input and output terminals of the outer cable

Annex A
(informative)

The absorbing clamp and its application for the measurement of interference power

A.1 General

The general method is shown in Figure A.1. The test lead B is connected direct from the appropriate port of the component under test, A. C is a current transformer or current probe placed around the test lead that provides an output voltage proportional to the resultant current in the lead. D and E are ferrite tubes or series of ferrite rings that surround respectively the test lead and the screened lead to the measuring instrument. As shown in Figure A.2, a satisfactory device that covers the frequency range 30 MHz to 300 MHz has been constructed, using 56 rings of ferrite for D and 60 similar rings for E. The current transformer C is made of three such rings encircled by a single turn of screened wire. C and D are mounted in fixed relative positions as close together as practicable, in such a way that the distance d can be varied. Both D and E serve to load their respective cables and to attenuate currents flowing along them.

A.2 Mains lead testing

When the lead under test forms the main supply and the h.f. isolation between the mains supply and the input of the measuring device on the side of the appliance appears to be insufficient, a fixed ferrite absorber F should be placed along the mains lead at a distance of approximately 4 m from the appliance. This improves the stability of the loading impedance and reduces extraneous noise coming from the mains supply.

A.3 Position of measuring device

When the connector of the measured appliance makes it impossible to position the measuring device at the first maximum, the second maximum may be used, the lead being extended via connector G. The reading should be increased by 1 dB (see curve B in Figure A.4).

A.4 Test lead length

The straight portion of the test lead should be about ($\lambda_{max}/^2$) + 60 in order to allow the positioning of the measuring devices at any time (λ_{max} is the wavelength corresponding to the lowest frequency at which measurements are to be made).

A.5 Calibration of measuring device

When the measuring device is being calibrated, it is assembled as in Figure A.1, except that the test lead is replaced by an insulated wire of effective cross-section approximately 1 mm^2 to 2 mm^2 and that the end that is normally connected to the appliance, is connected instead to the centre pin of a connector arranged to feed through the wall of a screened enclosure. A generator with 75 Ω output impedance is connected to the other end of the connector through a 75 Ω attenuator that has an attenuation of at least 10 dB (see Figure A.3).

The measuring device is then positioned for maximum indication. From the generator output indication and attenuator setting, a calibration curve can be drawn in terms of the available power at the output of the attenuator.

A.6 Method used to establish the calibration curve shown in Figure A.4

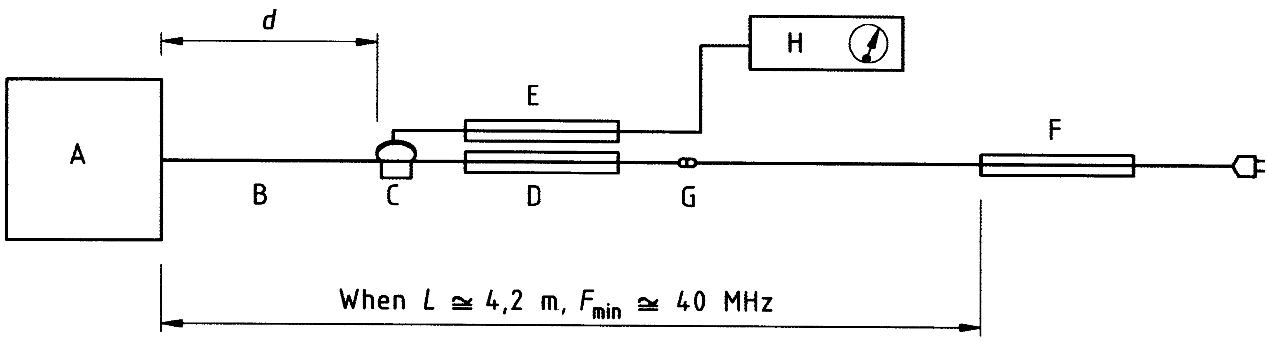
The calibration described in A.5 can be assumed to be a measurement of the insertion loss of a quadripole. The input of the two-port is effectively at the coaxial terminal in the wall of the screened room and the output is at the input of the measuring receiver.

As a precaution, and to avoid possible spurious effects of mismatch in the cable, a 10 dB attenuator is inserted before the coaxial connector. When the switch S is in the position shown in Figure A.3, a signal is injected and the receiver indication is noted. When the absorbing device is adjusted for maximum response, the attenuation position A_1 of the generator is noted. The generator is then connected to the receiver direct, and the attenuator is adjusted to A_2 to give the same reference reading.

The insertion loss shown in Figure A.4, is given by:

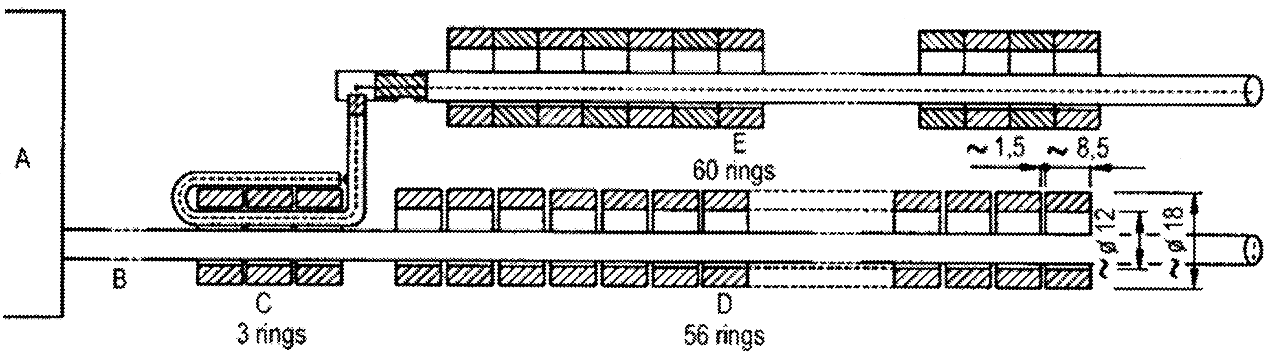
$(A_1 - A_2 - 10)$ dB (curve A, first maximum).

It can be shown that, if the generator and the receiver each has an internal resistance of 75 Ω, and if the insertion loss of the measuring device (after the 10 dB attenuator) is 18.75 dB, the indication on the receiver expressed in decibels (microvolts) has the same numerical value as the available power expressed in decibels (picowatts) at the output of the signal generator. This is the reason for the correction scale shown in Figure A.4. The correction scale gives the factor, in decibels, to be added to the indication of the receiver in decibels (microvolts), to convert the reading to power in decibels (picowatts).



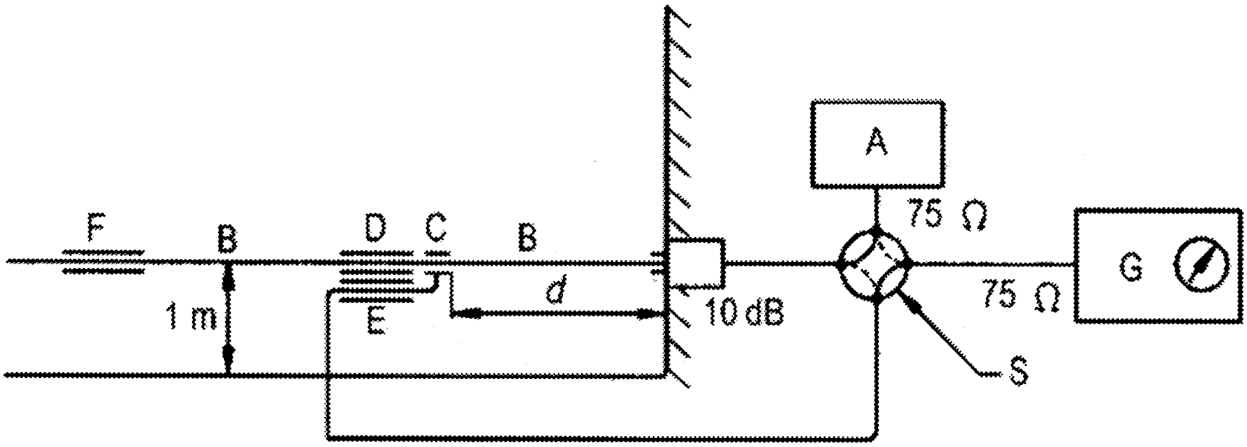
Key
A Component under test
B Test lead
C Current transformer/probe
D Ferrite tubes/rings
E Ferrite tubes/rings
F Ferrite absorber
G Connector
H CISPR receiver

Figure A.1 — Schematic diagram — Measurement of interference power between 30 MHz and 300 MHz



Key
A Signal generator
B Test lead
C Current transformer/probe
D Ferrite tubes/rings
E Ferrite tubes/rings

Figure A.2 — Detail of absorbing clamp



Key
A Signal generator
B Test lead
C Current transformer/probe
D Ferrite tubes/rings
E Ferrite tubes/rings
F Ferrite absorber
G CISPR receiver
S Coaxial switch

Figure A.3 — Schematic diagram — Calibration of the absorbing clamp between 30 MHz and 300 MHz

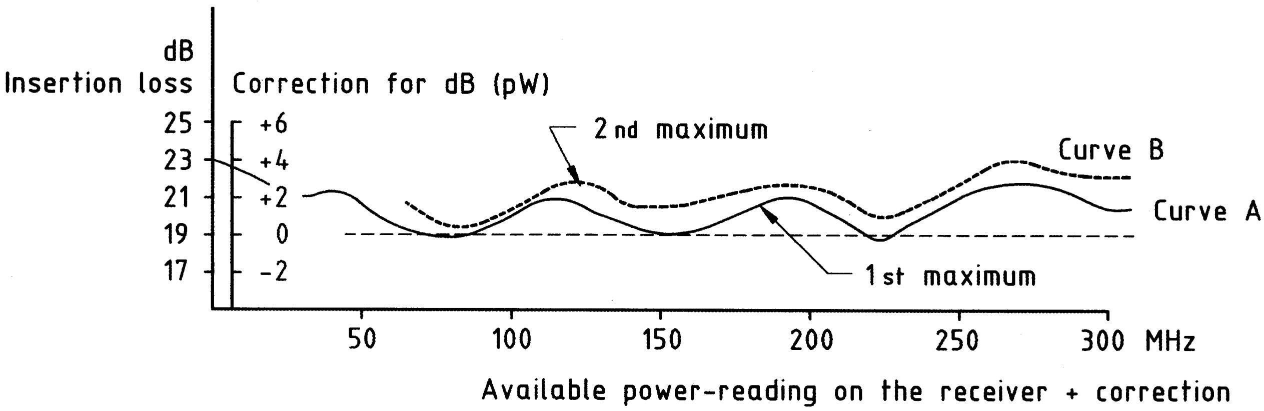


Figure A.4 — Calibration of the absorbing clamp (example)

Annex B
(informative)

The stop filter

B.1 Function

The stop filter has to give an effective blocking of either the radio-frequency current flowing on the outside of a screened cable or the asymmetrical radio frequency currents flowing in a mains lead. It is tuned to a specific frequency, which should be variable over a certain range.

The layout of a stop filter is shown in Figure B.1. The stop filter works as a quarter wave stub. It is made from two concentric metal tubes at some distance from each other. The coaxial cable or the mains lead passes through the inner tube, without making any metallic contact with the filter. A short-circuiting plunger is inserted between the two tubes. This short-circuit is transformed to a very high impedance at the open end of the filter a quarter wave-length away. Therefore a current in the filter of a frequency that corresponds to the quarter wave-length will be zero at the open end. As the diameter of the stop filter is much less than a wave-length, the currents at the same frequency that flow on the outside of the screened cable, or the asymmetrical currents in the conductors of the mains lead, have to be zero at the point where the cable, or mains lead, enters the stop filter.

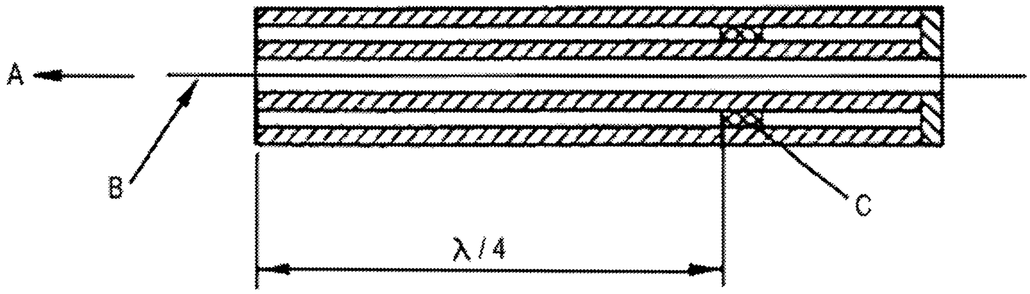
B.2 Construction

The inner one of the two metal tubes of the stop filter could be mounted inside the outer one by means of a metallic support at the far end of the filter. This support should be so strong that no other support than the short-circuiting plunger is needed for a stop filter used at UHF. For lower frequencies, the corresponding long length of the filter will necessitate a support at the end towards the component under test. This support should be made of insulating material that has a low power factor.

Means should be provided to adjust the position of the plunger, for instance by one or more rods connected to the plunger and penetrating through the short-circuit support at the far end of the filter or by handles connected to the plunger and penetrating through longitudinal slots in the outer tube of the filter.

B.3 Frequency calibration

Owing to the "edge effect" at the input end of the two tubes, the frequency calibration of the stop filter is not given direct by the geometrical distance from the input end to the short-circuit. Instead, the calibration is made by inserting a single insulated conductor through the filter; at the input end of the filter, the conductor is connected to a signal generator and at the far end, it is connected to a receiver. No connections should be made between the earth of the signal generator, or receiver, and the stop filter. For each frequency of tuning of the signal generator, the stop filter should be tuned by so moving the short-circuiting plunger that a minimum indication is observed at the receiver. A calibration curve can then be made. Because a single conductor is used and the earth is not defined, parasitic resonances can occur in the calibrating set-up, which can give rise to calibration errors. For this reason, the calibration should be carried out carefully, by checking that the calibration curve is smooth.



Key
A To the component
B Coaxial cable or mains lead
C Movable short-circuiting plunger

Figure B.1 — Stop filter

